Chapter 28
Musculoskeletal Disorders

Learning Objectives

- Discuss, describe the basic anatomy and function of the musculoskeletal system
- Discuss the general assessment, physical examination findings, and treatment of musculoskeletal conditions
- Discuss the causes, identification, and prehospital management of acute and chronic low back pain

Learning Objectives (Cont'd)

- Discuss the causes, identification, and prehospital management of acute and chronic neck pain
- Discuss the causes, identification, and prehospital management of overuse injuries
- Discuss the causes, identification, and prehospital management of generalized muscle disorders
Learning Objectives (Cont’d)

- Discuss the causes, identification, and prehospital management of generalized joint disorders
- Discuss the causes, identification, and prehospital management of infectious diseases of the musculoskeletal system

Learning Objectives (Cont’d)

- Discuss the causes, identification, and prehospital management of neoplastic disorders of the musculoskeletal system
- Discuss the causes, identification, and prehospital management of a child with a limp not associated with trauma

Anatomy and Physiology

- Adult skeleton
  - 206 bones
  - Axial
    - Skull
    - Vertebral column
    - Sternum
    - Rib cage
Anatomy and Physiology (Cont’d)

- Adult skeleton
  - Appendicular
    - Shoulders
    - Pelvis
    - Limbs

- Adult skeleton
  - Bones
    - Long
    - Short
    - Flat
    - Sesamoid
    - Irregular

- Adult skeleton
  - Joints
    - Bones, ligaments meet
    - Ligaments
    - Synovial joint
    - Rich, vascular, nerve supplies
    - Allow proprioception
Anatomy and Physiology (Cont’d)

Synovial Joint

- Adult skeleton
  - Skeletal muscles
    - Move skeleton
    - 600+
    - 40% body weight
    - Attachments
    - Tendon
    - Atrophy

General Assessment and Treatment

- Elements of history
  - Length of present complaint
  - Quality and severity
  - Radiation
  - Isolation
  - Irritated by movement
  - Physical signs
  - Associated symptoms
  - Current pain management
General Assessment and Treatment (Cont’d)
- Focused musculoskeletal examination
  - Symmetry
  - Deformity
  - Skin findings
  - Palpation of affected muscles and bony points
  - Strength of affected muscles
  - Range of motion
  - Assessment of sensation and circulation

General Assessment and Treatment (Cont’d)
- General treatment principles
  - Immobilization
  - Cervical, spinal stabilization
  - Ice
  - Elevation
  - Pain medication

Acute and Chronic Back Pain
- Risk factors
  - Pain ≥6 weeks in duration, >50 years, history of cancer, weight loss, night pain, unremitting pain even when supine, motor weakness, sensory loss, or bowel or bladder incontinence
    - Suggests tumor
  - Fever, chills, IV drug abuse, immune system disorder, unremitting pain
    - Suggests infectious process
Acute and Chronic Back Pain (Cont'd)

- Risk factors
  - Abdominal pain, blood in urine/stool, abdominal pulsatile masses, vomiting
    - Possible acute intraabdominal process
    - Abdominal aortic aneurysm
  - Sharp, unilateral pain radiating to flank, groin
    - Possible hematuria, kidney stone

Acute and Chronic Back Pain (Cont'd)

- Risk factors
  - Midback pain
    - Cardiac ischemia
    - Pancreatitis
    - Pneumonia
    - Aortic dissection

Acute and Chronic Back Pain (Cont'd)

- Causes
  - Strain
  - Herniated disc
  - Sciatica
  - Cauda equine syndrome
Acute and Chronic Back Pain
(Cont'd)
Lateral Lumbar Disc Herniation

Acute and Chronic Neck Pain

● Assessment
  ➢ Complete general history, examination
  ➢ Neck position at rest
  ➢ Shoulder, arm movement bilaterally
  ➢ Cervical strain
  ➢ Cervical, upper back muscle injury

Acute and Chronic Neck Pain
(Cont'd)

● Causes
  ➢ Traumatic injury
  ➢ Heavy lifting
  ➢ Everyday stress
Acute and Chronic Neck Pain (Cont'd)

- Cervical strain
  - Cervical, upper back muscle pain
  - Acute neck, trapezius pain without neurological symptoms

Acute and Chronic Neck Pain (Cont'd)

- Cervical strain
  - Signs/symptoms
    - Pain
    - Stiffness
    - Upper back tightness
    - Shoulder tightness

Acute and Chronic Neck Pain (Cont'd)

- Cervical strain
  - Management
    - Supportive
    - Analgesics
    - Transport
Acute and Chronic Neck Pain (Cont'd)

- Cervical spondylosis
  - Progressive degenerative disease
  - Cervical stiffness
  - Pain with movement
  - Limited range of motion

- Cervical disc herniation
  - Affects C5-C7
  - Symptoms
    - Neck pain
    - Headache
    - Pain radiates to shoulder
    - Decreased sensory input in shoulder/arm

- Acute, chronic neck pain
  - Management
    - Supportive
    - Analgesics
    - Transport, position of comfort
    - Cervical immobilization
Injuries and Overuse Syndromes

- Sprains and strains
  - Sprains
    - Overstretched ligament
    - Joint forced in unnatural position
  - Strains
    - Overstretched muscle, tear in muscle fibers

Injuries and Overuse Syndromes (Cont'd)

Ankle Sprains

Injuries and Overuse Syndromes (Cont'd)

- Sprains and strains
  - Assessment
    - Sudden pain associated with activity
    - Localized swelling
    - Ecchymosis
    - Erythema
    - Warmth, pain on palpation
Injuries and Overuse Syndromes (Cont'd)

- Tendonitis
  - Tendon inflammation
  - Causes
    - Repeated use
    - Awkward/sustained postures
    - Vibration
    - Cold temperatures
    - Insufficient recovery time between activities
    - Monotonous/repetitive motions

Injuries and Overuse Syndromes (Cont'd)

- Tendonitis
  - Findings
    - Pain at attachment points
    - Pain on active range of motion
    - Crepitus

Injuries and Overuse Syndromes (Cont'd)

- Carpal tunnel syndrome
  - Wrist pain
  - Cause
    - Compression of the median nerve
    - Ligament thickening bridging arch of the carpal bones
Injuries and Overuse Syndromes (Cont'd)

- Carpal tunnel syndrome
  - Signs/symptoms
    - Nummness in first three fingers, weakness
    - Pain radiates to elbow/neck
    - Weakness of thumb on abduction
    - Medial nerve pain on wrist hyperflexion
  - Management
    - Immobilize
    - Joint compression with elastic wrap
    - Elevation, reduce swelling
    - Ice application
    - Analgesic per protocol
    - Transport
Generalized Muscle Disorders

- Myositis
  - Rare muscle disease
  - Inflammatory diseases
  - Infectious diseases
  - Alcohol/drug abuse
  - Trauma

Generalized Muscle Disorders (Cont'd)

- Myositis (Cont'd)
  - Signs/symptoms
    - Muscle pain, weakness
    - Skin rashes
  - Management
    - Supportive care
    - Transport only

Generalized Muscle Disorders (Cont'd)

- Rhabdomyolysis
  - Injuries to skeletal muscle, tissue necrosis results
  - Associations
    - Direct trauma
    - Drug abuse
    - Infections
    - Medications
    - Temperature disorders
    - Toxins
    - Metabolic disorders
Generalized Muscle Disorders (Cont’d)

- Rhabdomyolysis
  - Muscle cell breakdown
    - Release of creatine, phosphokinase, myoglobin, potassium
    - Clogs kidney filtration system

Generalized Muscle Disorders (Cont’d)

- Rhabdomyolysis
  - Management
    - IV administration of NaCl at 500 mL/hr
    - Maintain urine output at 200-300 mL/hr

Generalized Muscle Disorders (Cont’d)

- Compartment syndrome
  - Increased pressure within fixed anatomic space
    - Compromises blood flow to area
    - Nerve injury, tissue death
Generalized Muscle Disorders (Cont'd)

- Compartment syndrome
  - Causes
    - Tissue fracture causes bleeding, soft tissue swelling in leg compartments
    - Soft tissue injuries
    - Thermal injuries
    - Constrictive casts, dressings
    - Arterial spasms/thrombosis
    - Venous disease
    - Snake bites
    - Bleeding disorders
    - IV infiltration

Generalized Muscle Disorders (Cont'd)

- Compartment syndrome
  - Signs/symptoms
    - Pain at rest, on palpation
    - Firm extremity
    - Pain on passive/active flexion of involved muscles

Generalized Muscle Disorders (Cont'd)

- Compartment syndrome
  - Management
    - Supportive
    - Analgesics
    - Rapid transport
    - Do not elevate leg
Generalized Joint Disorders

- Arthritis
  - Joint inflammation
    - Thickening of synovial fluid
    - Increased pain, cartilage rubs against cartilage
    - Joint stiffening
    - Calcium deposits in joint, ligament

Generalized Joint Disorders (Cont'd)

- Arthritis
  - Osteoarthritis/degenerative joint disease
    - Cartilaginous covering of joint surface wears away
    - Factors
      - Local inflammation
      - Mechanical forces
      - Genetics
      - Joint integrity
      - Joint trauma history

Generalized Joint Disorders (Cont'd)

- Arthritis
  - Signs/symptoms
    - Pain on palpation
    - Crepitus
    - Joint effusions
    - Bony enlargement
  - Malalignment
  - Decreased range of motion
  - Warmth
  - Erythema
Generalized Joint Disorders (Cont’d)

- Arthritis
  - Rheumatoid arthritis
    - Inflammatory process
      - Mediated by immune complex
      - Inflammation secondary to autoimmune response
      - Joint swelling
      - Pain

- Arthritis
  - Rheumatoid arthritis
    - Signs/symptoms
      - Morning stiffness 1+ hour, 6 weeks
      - 3+ joints swell, 6 weeks
      - Wrist, hand joints swelling, 6 weeks
      - Symmetric joint swelling
      - Radiological changes
      - Positive blood tests
      - Weight loss, fatigue, low-grade fevers, depression

Generalized Joint Disorders (Cont’d)

Osteoarthritis
Generalized Joint Disorders (Cont'd)

- Gout
  - Metabolic disease
  - Joints
  - Unilaterally
  - Not associated with trauma
  - Uric acid crystals deposit in joint space

Generalized Joint Disorders (Cont'd)

- Gout
  - Risk factors
    - Obesity
    - Joint trauma
    - Alcohol consumption
    - Overeating
    - Medications

Generalized Joint Disorders (Cont'd)

- Gout
  - Signs/symptoms
    - Severe joint pain
    - Warmth, swelling
    - Erythema
Generalized Joint Disorders (Cont’d)

- Gout
  - Management
    - Supportive
    - Analgesics
    - Transport, position of comfort

Infectious Disease of the Musculoskeletal System

- Septic arthritis
  - Invasion of microorganism into joint space
Infectious Disease of the Musculoskeletal System (Cont’d)

- Septic arthritis
  - Risk factors
    - Joint trauma history
    - Artificial joints
    - IV drug abuse
    - STDs
    - Immunosuppression history

- Septic arthritis
  - Infection
    - Direct inoculation
    - Spread from adjacent osteomyelites
    - Hematogenous spread

- Septic arthritis
  - Bacteria in joint space trigger host’s immune system
    - Battleground between host’s immune system and microorganisms’ products of metabolism
Infectious Disease of the Musculoskeletal System (Cont'd)

- Septic arthritis
  - Findings
    - Localized pain
    - Swelling
    - Erythema
    - Warmth
    - Limitations of passive/active range of motion

- Osteomyelitis
  - Microorganism invasion of bone
    - Innoculation
    - Direct extension of adjacent skin wound
    - Hematogenous spread from other sites

- Osteomyelitis (Cont'd)
  - Risk factors similar to septic arthritis
    - Sickle cell anemia
    - Recent orthopedic surgery
    - Vascular disease
    - Long-term steroid use
Infectious Disease of the Musculoskeletal System (Cont'd)

- Osteomyelitis
  - Management
    - Supportive
    - Analgesics
    - Treat for shock
    - Transport

Neoplastic Disorders

- Tumors
  - Primary
    - Rare
    - Diagnosed after radiographs, biopsies
    - Originating at bone

Neoplastic Disorders (Cont'd)

- Tumors
  - Secondary
    - Cancer spread
    - In spine
Neoplastic Disorders (Cont’d)

- Pathological fractures
  - Underlying disease process
  - Weakens mechanical properties of bone
  - Destruction of bone

Neoplastic Disorders (Cont’d)

- Pathological fractures
  - Findings
    - Pain
    - Deformity
    - Swelling
    - Loss of function

Neoplastic Disorders (Cont’d)

- Pathological fractures
  - Management
    - Supportive
    - Analgesics
    - Immobilization
    - Transport
Special Circumstances: Child with Limp

- Cause categories
  - Infections
  - Inflammatory process
  - Trauma
  - Bony deformities
  - Neoplastic diseases
  - Neuromuscular causes
  - Vascular disease

Special Circumstances: Child with Limp (Cont’d)

- Transient synovitis
  - Nonspecific inflammation of synovium and synovial fluid
  - Recent trauma, illness/medication reaction
  - Lasts less than 1 week

Special Circumstances: Child with Limp (Cont’d)

- Slipped capital femoral epiphysis
  - Displacement of femur growth plate posteriorly
  - Slow progression
  - Progressive pain history, suddenly worsened
**Special Circumstances: Child with Limp (Cont’d)**

Slipped Capital Femoral Epiphysis

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**Chapter Summary**

- In addition to fractures, the musculoskeletal system is subject to other injuries and disease processes
- In the prehospital setting, making an exact diagnosis for most musculoskeletal disorders is usually not possible or necessary; treatment principles are generally the same

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**Chapter Summary (Cont’d)**

- Careful history and physical examination may provide clues to more serious conditions
- Majority of musculoskeletal diseases and injuries are not life-threatening; prehospital treatment should be directed toward appropriate analgesia and comfort measures
Chapter Summary (Cont’d)

- When evaluating a patient with back pain, consider nonmusculoskeletal causes of pain, including cardiac, pulmonary, and abdominal conditions.